ABSTRACTS

### ВОПРОСЫ РАДИОЭЛЕКТРОНИКИ

### серия

### ТЕХНИКА ТЕЛЕВИДЕНИЯ

### 2019 вып. 3

*Avanesov G. A.* **Star Trackers for Spacecraft Attitude Control**. **Pp. 5–14.** The history, principles of construction and modern achievements in the field of creating domestic stellar spacecraft orientation sensors and the leading role of the IKI RAS in this area are considered. The role of the IKI RAS and solid-state television technology in the implementation of projects for the study of comet Halley and Phobos is noted. **Keywords:** Star sensors, astroorientation, Space research institute

*Umbitaliev A. A., Tsytsylin A. K., Baranov P. S., Zimin V. A., Mantsvetov А. А., Chirkunova А. А. Adamov D. U.* **Machine video systems for unmanned space exploration developed in JSC «Television scientific research institute». Pp. 15–24.** The factors of space that influence the operation of radio-electronic equipment for television purposes are considered. Methods of struggle with these factors are given. The characteristics of machine vision systems for unmanned space exploration, developed in JSC «Research Institute of Television» are given. Perspective systems of space-based machine vision systems are discussed. **Keywords**: Machine vision system, space TV, solid-state image sensor, CMOS image sensor, CCD image sensor

*Umbitaliev A. A., Kuzichkin A. V., Popov V. V., Aganov A. J., Taranov A. A.* **The main directions of development of a television infrastructure of modern spaceports. Pp. 25–32.** On the example of the spaceport «East» the main directions of development of the television infrastructure of the spaceport on the basis of centralization of control over the distribution of television information (TI) are considered. The necessity of intellectualization of the peripheral equipment of interface of sources of television information with a complex of the centralized distribution of TI, construction of the specialized wireless network of transfer of TI and adoption of the increased measures of ensuring information security is shown. **Keywords**: spaceport «East», digital complex of switching and distribution of television information

*Savinish V. P., Solomatin V. A., Torshina I. P.* **A device constructing local vertical with a panoramic mirror-lens system. Рр. 33–37.** The basic scheme and parameters of the static device for orientation on the Earth (the device constructing local vertical) of the space vehicle, using panoramic annular lens (PAL) are considered. **Keywords:** orientation of spacecraft, device for constructinglocal vertical, PAL.

*Sagdullaev Yu. S., Smirnov A. I*. **Development of television devices and their use in space practice. Рр. 38–46.** Considered are the developments related to the creation of the first domestic television automata to measure the relative motion parameters of the spacecraft as they approach, as well as the system for transmitting TV signals of multichannel telemetry information from the MCC to the cosmodrome in the interests of prelaunch preparation and launching of the Buran satellite. **Keywords:** television, spacecraft, measurement parameters movement, transmission of multi-channel information via communication channels

*Ivanov V. G., Kamenev A. A.* **Estimation of possibilities of detection of small space objects by ground optical-electronic means with ultra-long-focus telescopes**. **Рр. 47–52.** Using the methodology developed by authors for assessing the capa­bilities of the OES to detect space objects for foreign ultra-long-focus telescopes, estimates of the minimum values of their radiation strength in the visible and far infrared ranges are obtained, and which observation in the region of geostationary orbits is possible. **Keywords:** atmosphere, space object, optoelectronic means, scattered radiation, telescope

*Kamenev A. A., Soluyanov A. A.* **Modelling of space vehicles directed emission and infrared brightness for detection of space vehicles technical conditions signs. PP. 53–60.** Main points of infrared brightness images modelling method for structurally non-trivial space objects are described. For small-sized space vehicle on low Earth orbit the results of calculations of directed emission and brightness images are presented. **Keywords:** space vehicle, radiant intensity phase function, optoelectronic system, spectroenergetic characteristic, brightness images.

*Tsytsulin A. К., Pavlov V. A., Bobrovsky A. I., Morozov A. B.* **Information evaluations of signal detection–estimation–transfer task in space television systems. PP. 61–74.** The task of observed on a starry background small-sized space objects coordinates detection–estimation by onboard passive television systems is considered from the perspective of the dominant information principle. An asymmetry of detection threshold, which ensures equal loss of dominant information and noise information by equalizing the probability of skipping the signal of the object and the probability of false alarm, multiplied by the number of degrees of freedom, is justified. **Keywords:** information risk, quality of information, signal distinction

*Tsytsulin A. K., Pavlov V. A., Bobrovsky A. I., Morozov A. V., Zubakin I. A.* **Adaptive coding of images divided into dominant object and background.
PP. 75–85.** A method for encoding video sequences with the possibility of dividing an image into a dominant object and background is considered. It is shown that the use of image segmentation methods the methods of detecting and tracking moving objects using neural network image processing allows, while maintaining the quality of information about the dominant object, to achieve great compression of video information. **Keywords:** coding, segmentation, detection, tracking, weighted root-mean-square error, neural network

*Bachevsky S. V., Dvornikov S. V., Ustinov A. A., Dvornikov S. S.* **Prospects of development of video transfer in space television systems. PP. 86-92**. The article presents the results of a study of possible ways to increase the speed of video transmission while maintaining quality in space television systems. The efficiency indicators are justified and the limits of the range of acceptable values are determined. The perspective of transition to optical frequency ranges is shown. The factors influencing the improvement of video transmission systems are analyzed. **Keywords:** video transmission systems, Shannon's equation, prospects for the development of space television

*Dvornikov S. V., Vlasenko V. I., Tsarelungo F. B., Balykov A. A., Borisov V. V., Timashev P. V.* **A simple approach to calculating the drop of signals in the networks of broadband access. PP. 93–100**. A simplified approach has been developed for the analytical calculation of signal attenuation in broadband access networks. The results of its comparison with the models COST231-HATA and Okamura-Hata are presented. The data of mathematical modeling in the Matcad environment are given. The scope of the approach is determined and the prospects for its use are shown. **Keywords:** broadband access networks, signal attenuation model, interference attenuation formula

*Demin A. V., Polishuk G. S., Sechak E. N.* **Optical and electronic complexes for microsputnikes. PP. 101-106**. The article discusses and substantiates the option of creating an optical-digital system for remote sensing of the Earth’s surface of enhanced information content for microsatellites. An algorithm and a mathematical model for assembling and adjusting the main mirror of a telescope made using the technology of composite mirrors are proposed. **Keywords**: optoelectronic complex, mirror, remote sensing, adaptive optics, adjustment

*Ezerskiy V. V., Maksimov S. V., Chernogubov A. V.* **The minimization of computing resources with the geo-referenced space of hydrometeorological information in the perspective of ground receiving stations. PP. 107-112**. The article presents algorithms for georeferencing images taken by promising ground stations receiving, processing and retransmission of space hydrometeorological geo and heliophysical information. The proposed algorithm to perform the geo-referencing minimizing the computational resources required. It is assumed that the results of this article will be used in the development of promising stations for receiving information from remote sensing spacecraft. **Keywords**: geolocation, images of Earth from space

*Kamenev A. A., Lapovok Y. V.* **Methodic calculation of the thermal modes and directly thermal emissive power of the cell structure metal mash size space antenna. PP.** **113-120**. Analytic methodic calculation of the thermal modes thin wire metal mash parabolic antenna as the plain surface with combination of multiple repeated square cells are described. Antenna temperatures along the shadow and solar path sections are calculated. Possibility of the thermal modes and directly emissive power parabolic antenna calculation using only this stationary thermal mode are substantiated. **Keywords**: Antenna, space apparatus, metal mash, thermal modes, directly thermal emissive power.

*Suslin V. I., Lykova E. M.* **First domestic high-orbital television apparatus for detection «Apogee».** **PP.** **131–127**. The work of the All-Union Television Research Institute of on a high-orbit television system for the early detection of missiles in 1970–1980 is described**. Keywords:** «Apogee», high-orbit television system

*Balanin L. N.* **VTR for scientific research in space and on earth**.
**Рр.** **128–133.** The application of wideband magnetic recording devices (UMZ), created on the basis of broadcasting VTR, used method of helical scan recording by rotating heads, for recording the results of scientific research is considered. Design features and technical data of earth and space UMZ are given. **Keywords:** magnetic recording device, communication systems, predetector recording, non-operating mode.